HF Jet Tagging: MAPS DCA3D Tagging

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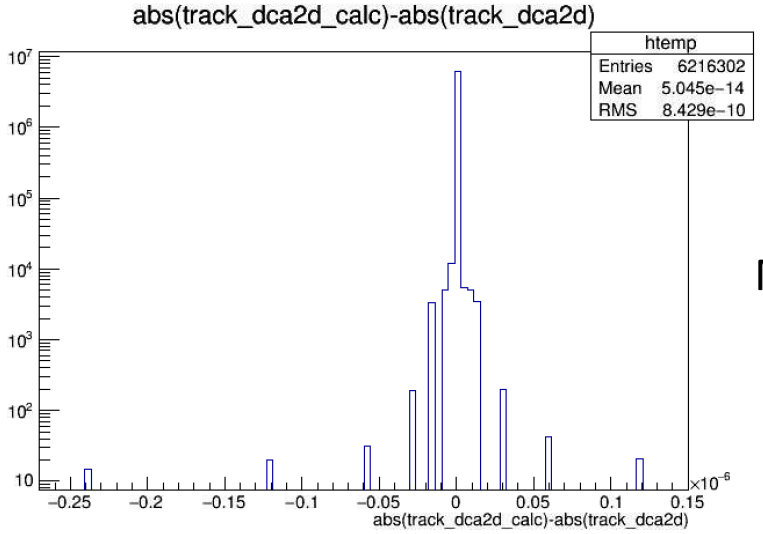
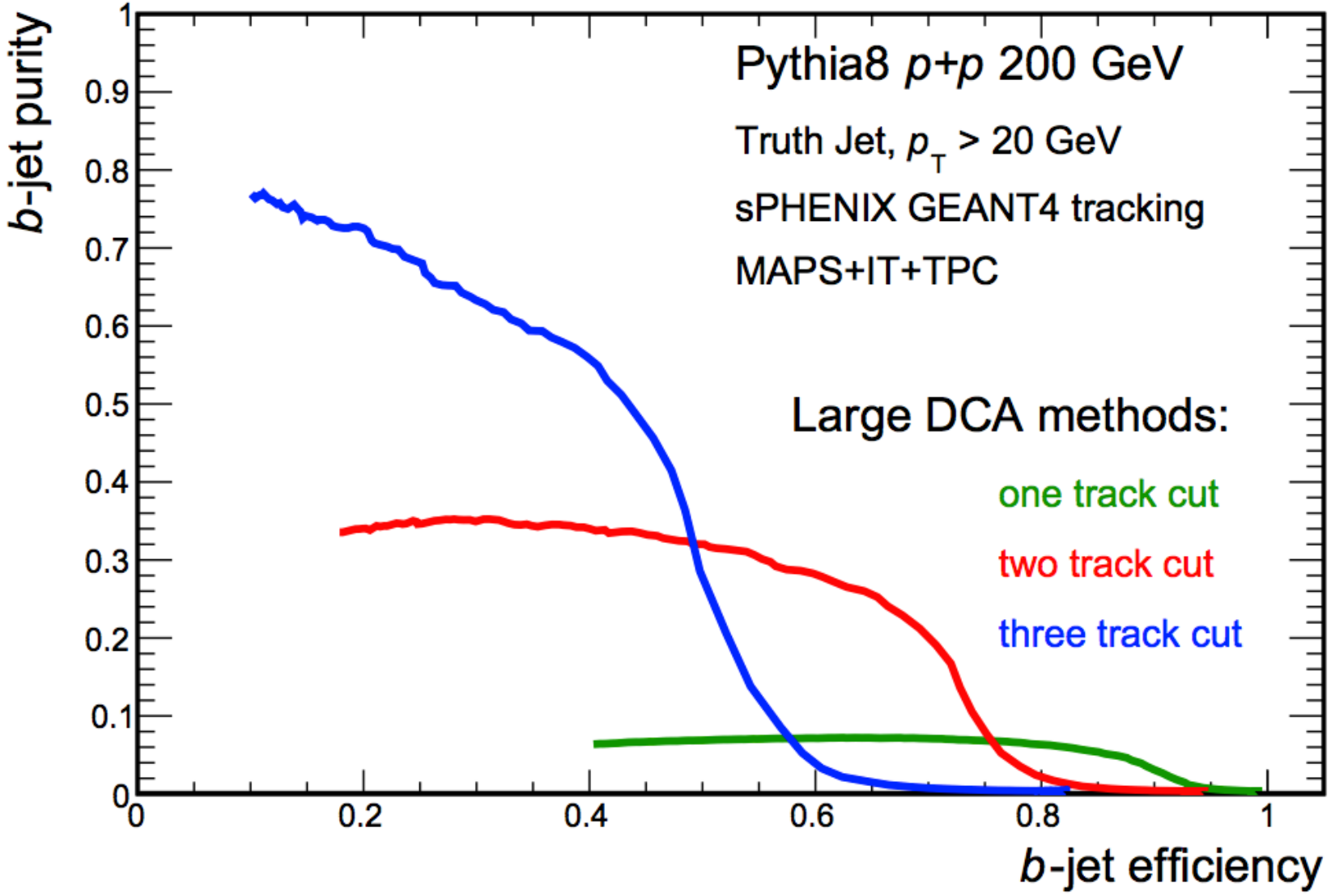
How we calculate DCA3d

- Assume the track is strait line from track point, along the track momentum direction. Calculate the distance from vertex to this line in 2d/3d (dca2d, dca3d).
- We verified this by comparing this calculated dca2d with the default PHG4HoughTransformTPC result.

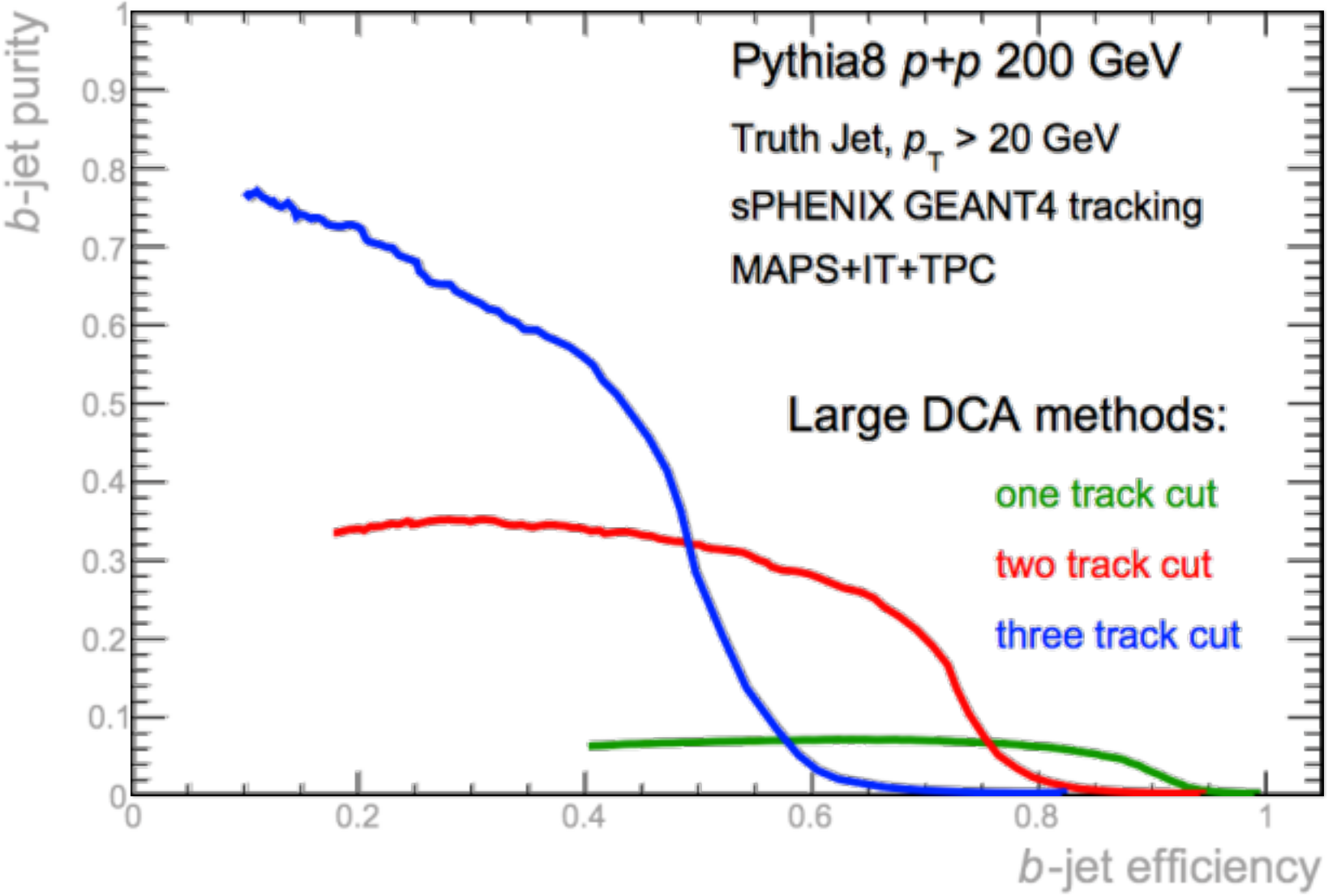


MAPS+IT+TPC

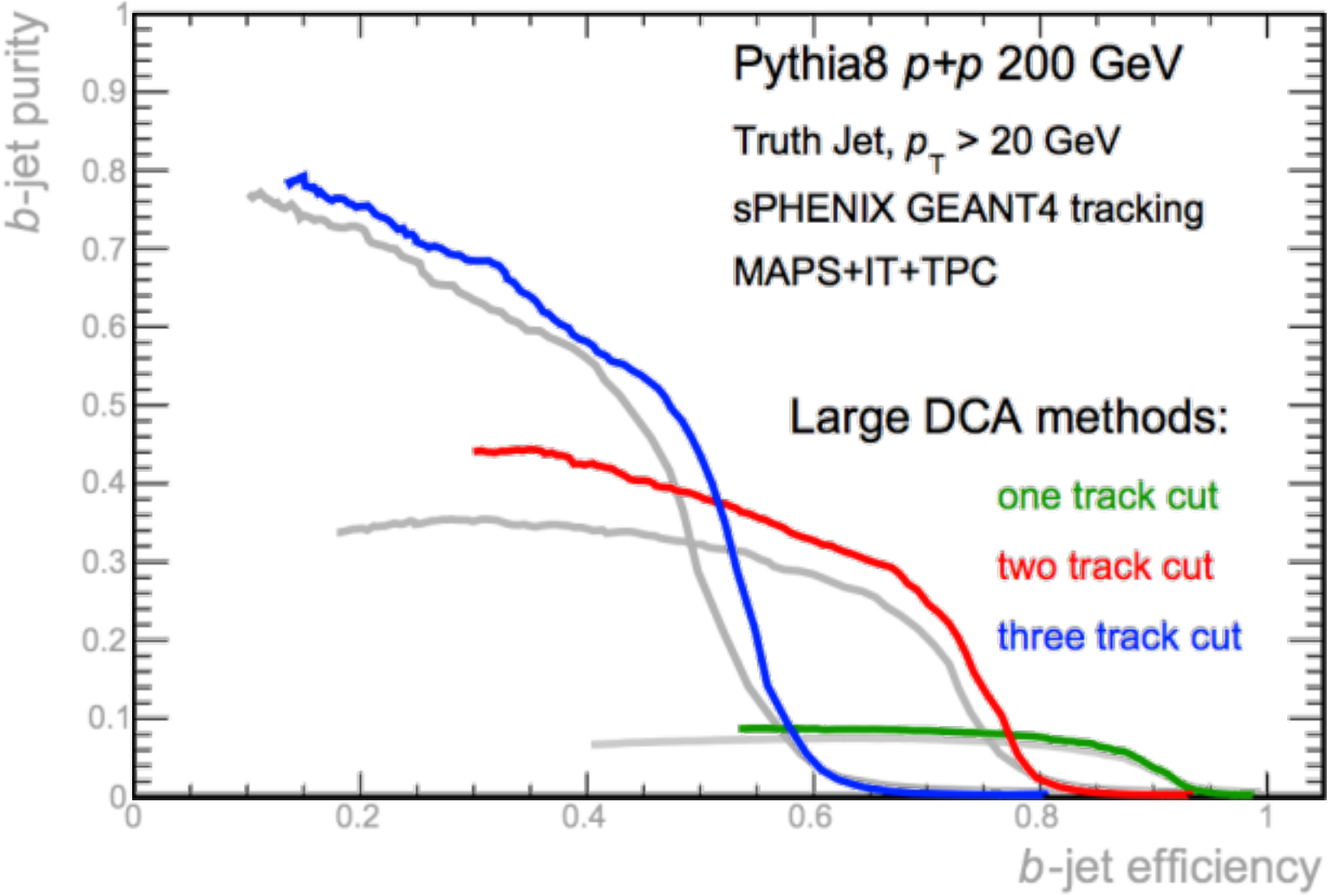
dca2d - default



dca2d - default (grey) vs. strait line calc. (color)



dca2d - default (grey) vs. dca3d strait line calc. (color)



Backups:

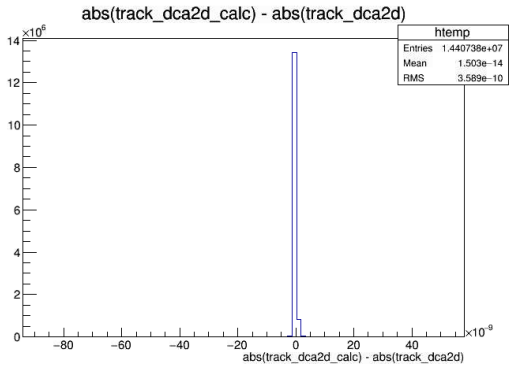
MIE

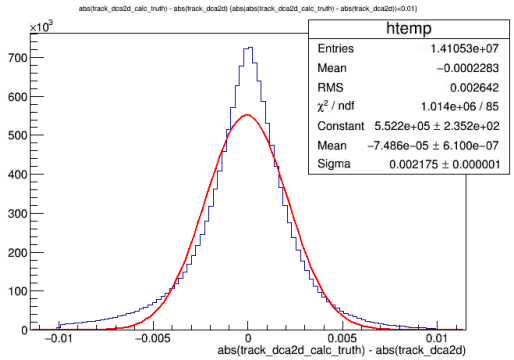
Strait line calculation
Reco vertex

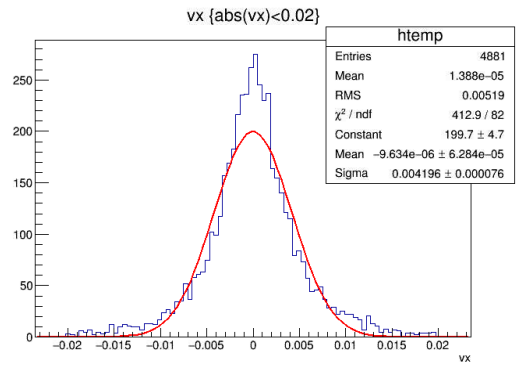
Strait line calculation
Truth Vertex

Reco Vertex X

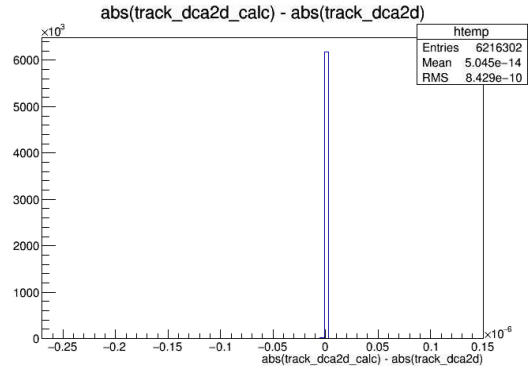
MIE

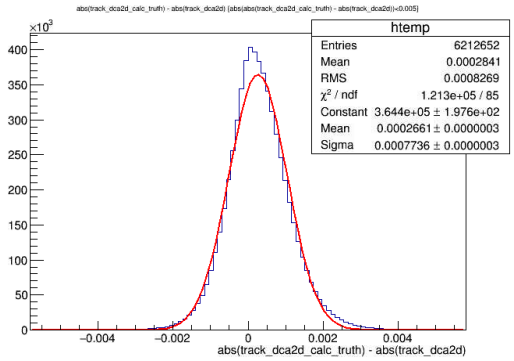


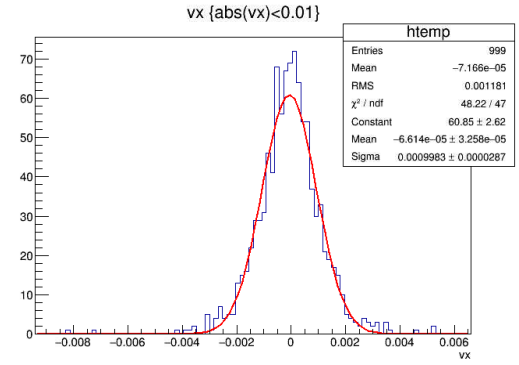


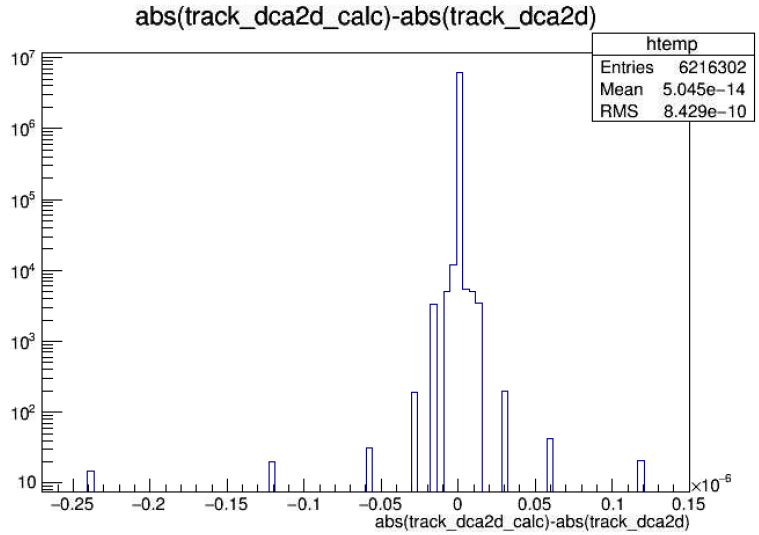


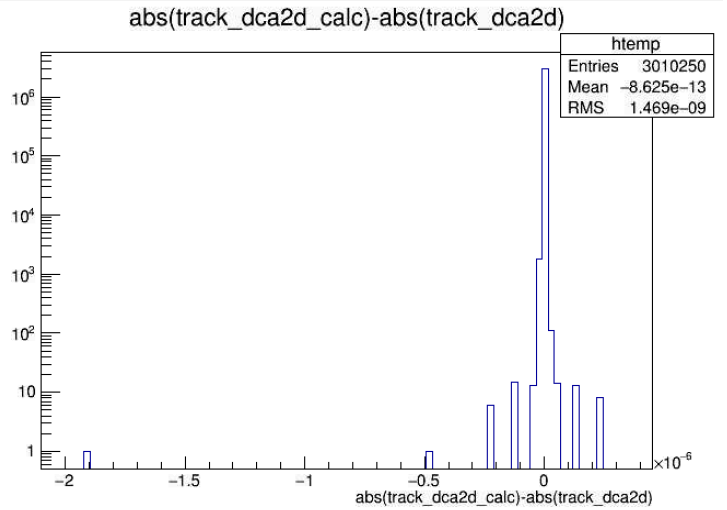
MAPS+IT+TPC

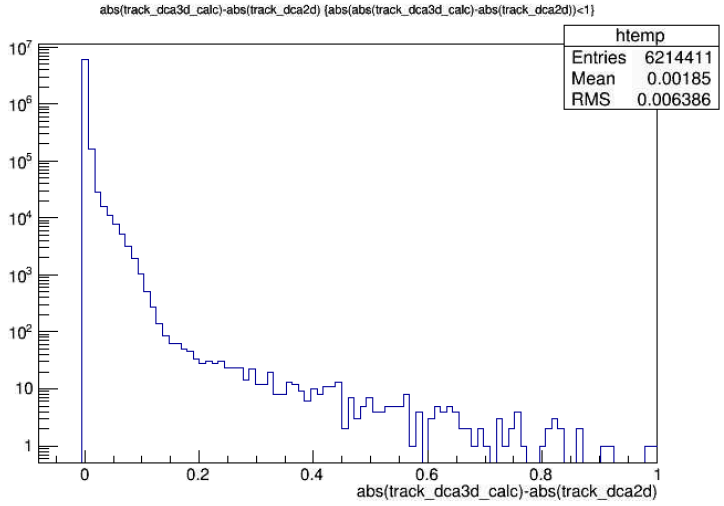


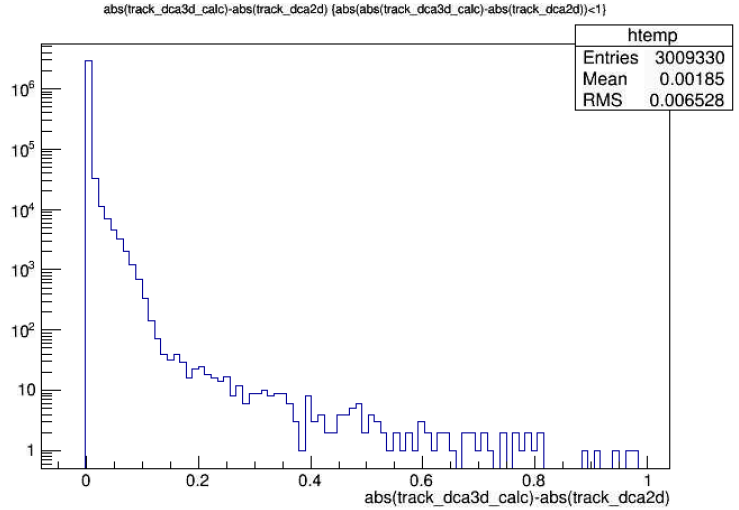


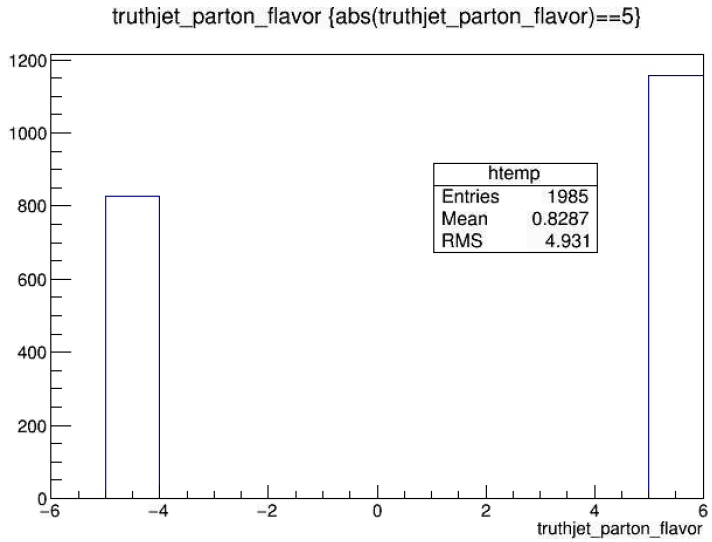


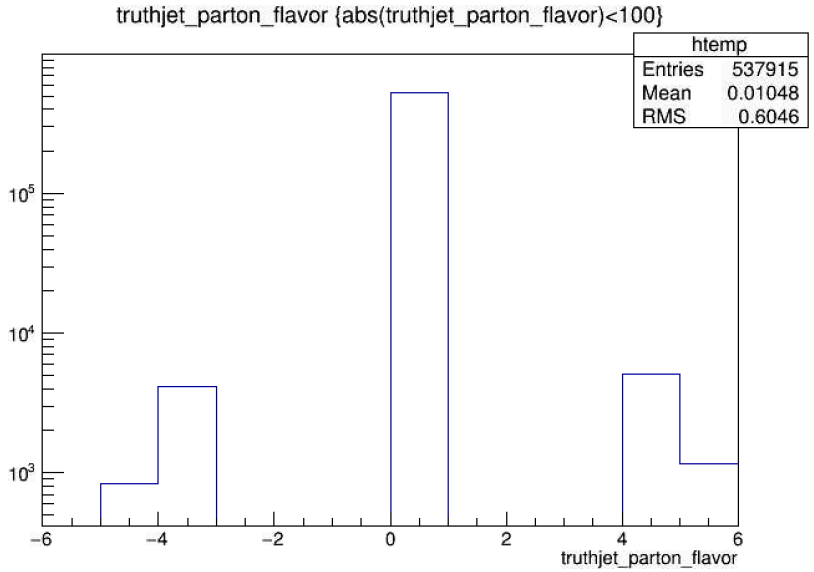

abs(track_dca2d_calc)-abs(track_dca2d)
htemp
Entries 6216302
Mean 5.045e−14
RMS 8.429e−10
×10⁻⁶
abs(track_dca2d_calc)-abs(track_dca2d)


abs(track_dca2d_calc)-abs(track_dca2d)
htemp
Entries 3010250
Mean −8.625e−13
RMS 1.469e−09
×10⁻⁶
abs(track_dca2d_calc)-abs(track_dca2d)


abs(track_dca3d_calc)-abs(track_dca2d) {abs(abs(track_dca3d_calc)-abs(track_dca2d))<1}
htemp
Entries 6214411
Mean 0.00185
RMS 0.006386
abs(track_dca3d_calc)-abs(track_dca2d)


abs(track_dca3d_calc)-abs(track_dca2d) {abs(abs(track_dca3d_calc)-abs(track_dca2d))<1}
htemp
Entries 3009330
Mean 0.00185
RMS 0.006528
abs(track_dca3d_calc)-abs(track_dca2d)


truthjet_parton_flavor {abs(truthjet_parton_flavor)==5}
htemp
Entries 1985
Mean 0.8287
RMS 4.931
truthjet_parton_flavor


truthjet_parton_flavor {abs(truthjet_parton_flavor)<100}
htemp
Entries 537915
Mean 0.01048
RMS 0.6046
truthjet_parton_flavor

dca calculation

Using track_point, track_direction (momentum), and event vertex.

```
double calc_dca(const TVector3 &track_point, const TVector3 &track_direction, const TVector3 &vertex) {

        TVector3 VP = vertex - track_point;
        double d = -99;

        if(track_direction.Mag() > 0) {
                d = (track_direction.Cross(VP)).Mag() / track_direction.Mag();
        }

        return d;
}
```